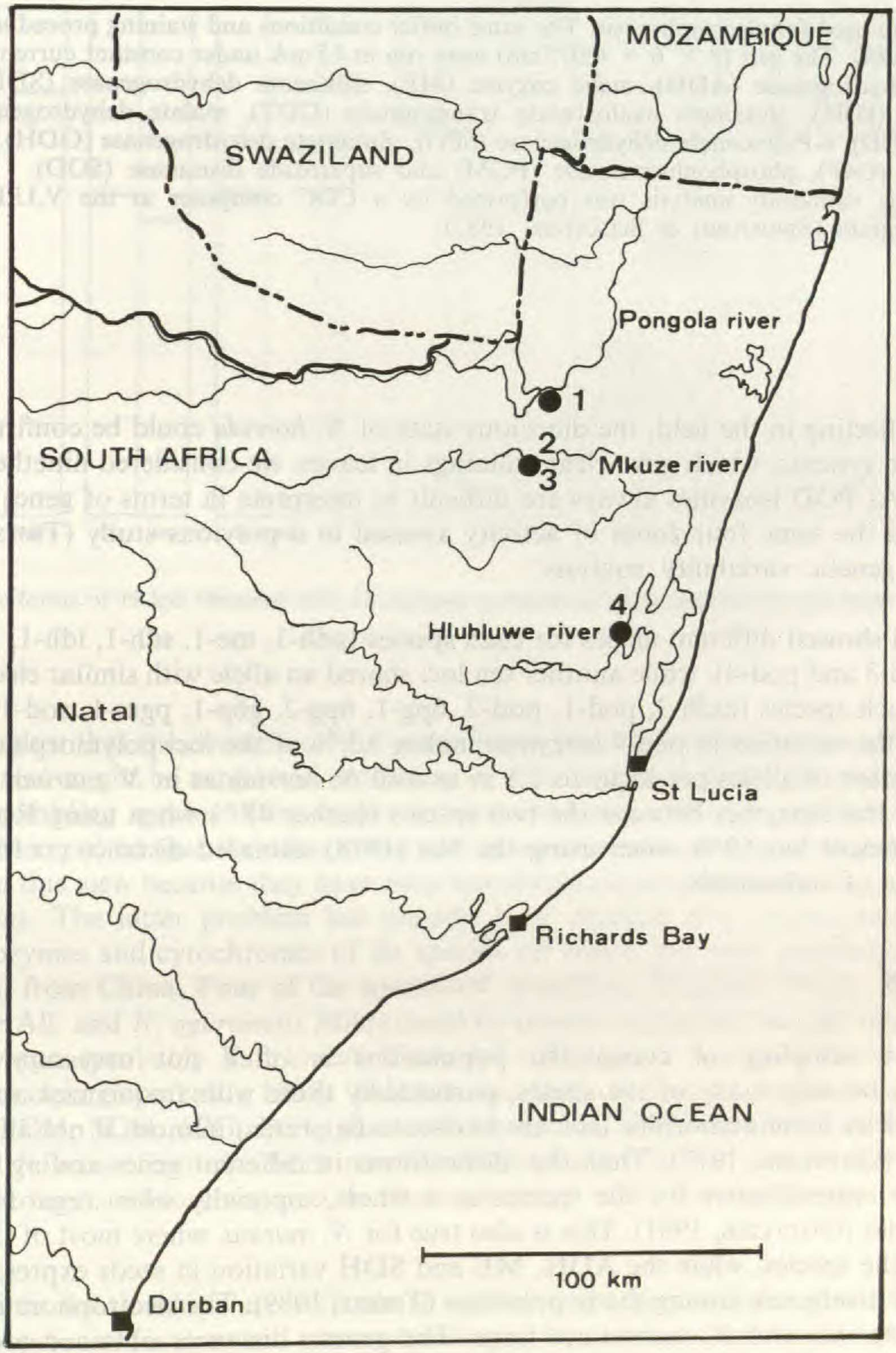

Fig. 1. — *Najas horrida* (1 and 2) and *Najas marina* subsp. *armata* (3 and 4) populations from Natal, investigated for leaf isozymes.

Then the plants were again transported in plastic bags to Belgium during one day. Upon arrival, the different individuals were frozen and stored in liquid nitrogen and examined within three weeks.

Leaves were used for electrophoresis. The same buffer conditions and staining procedures were used as in TRIEST (1989). The gels (9 × 6 × 0.075 cm) were run at 15 mA under constant current and stained for alcohol dehydrogenase (ADH), malic enzyme (ME), shikimate dehydrogenase (SDH), isocitrate dehydrogenase (IDH), glutamate oxaloacetate transaminase (GOT), malate dehydrogenase (MDH), peroxidases (POD), 6-P-gluconate dehydrogenase (6PG), glutamate dehydrogenase (GDH), glucose-6-P-dehydrogenase (G6P), phosphoglucomutase (PGM) and superoxide dismutase (SOD).

The genetic variability analysis was performed by a CDC computer at the V.U.B., using the BIOSYS-1 program (SWOFFORD & SELANDER, 1981).

RESULTS

When collecting in the field, the dioecious state of *N. horrida* could be confirmed. Of the twelve enzyme systems, which gave clear stainings in leaves, we considered ninetheen putative loci (Fig. 2). As POD isozymes always are difficult to interprete in terms of genes and alleles, we considered the same four zones of activity as used in a previous study (TRIEST, 1989) to perform the genetic variability analysis.

Nine loci showed different alleles for each species (adh-1, me-1, sdh-1, idh-1, got-1, mdh-1, mdh-2, pod-3 and pod-4), while another ten loci shared an allele with similar electrophoretic mobility in each species (mdh-3, pod-1, pod-2, 6pg-1, 6pg-2, g6p-1, pgm-1, sod-1, gdh-1 and gdh-2). Only the variation in pod-4 isozymes makes 5.3 % of the loci polymorphic and raised the mean number of alleles per locus to 1.1 in as well *N. horrida* as in *N. marina*. The genetic divergence of leaf isozymes between the two species reaches 45 % when using ROGERS (1972) distance coefficient but 59 % when using the NEI (1978) unbiased distance coefficients for a small number of individuals.

DISCUSSION

Extensive sampling of conspecific populations is often not necessary for species comparisons, because many of the alleles, particularly those with frequencies above 0.20, as well as the alleles in monomorphic loci, are known to be present in most, if not all populations of a species (GOTTLIEB, 1977). Thus the allelic forms in different genes coding for enzymes generally are representative for the species as a whole, especially when regarding the most common alleles (GOTTLIEB, 1981). This is also true for *N. marina*, where most of the alleles are common to the species, while the ADH, ME and SDH variation in seeds expressed the main tendencies of divergence among the populations (TRIEST, 1989). The electrophoretic differences between *N. horrida* and *N. marina* are large. The genetic distances obtained are among the highest when compared to the values generally found for congeneric species. GOTTLIEB (1981) reported that for congeneric species, the genetic identity values calculated after NEI, are ranging from (0.28-)0.47-0.94(-0.99) and this with an average of 0.67. Moreover, all the leaf enzymes in both species investigated here, appeared to be monomorph, except for peroxidases.

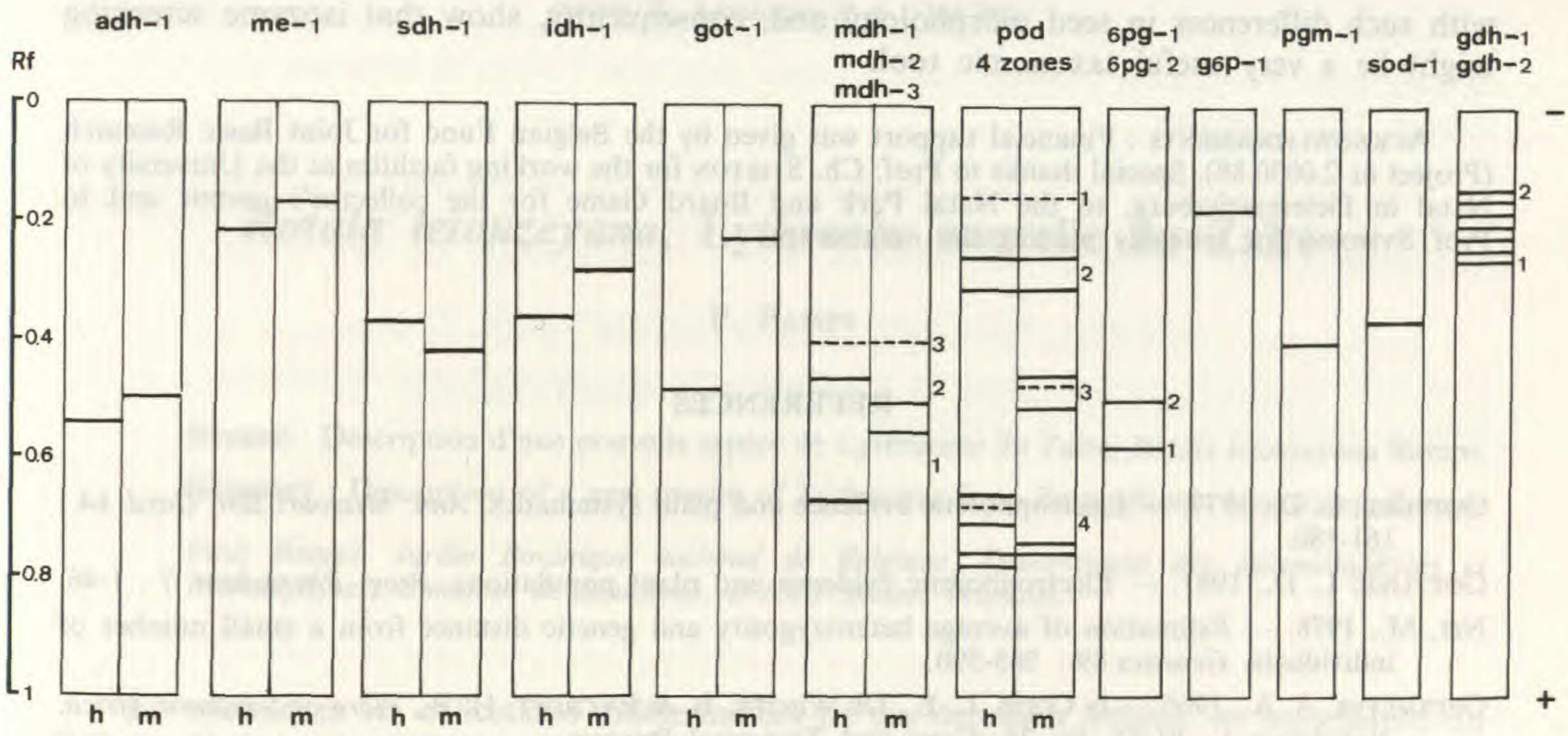

Fig. 2. — Allelic forms of 19 loci obtained with 12 enzymes in leaves of *Najas horrida* (h) and *Najas marina* subsp. *armata* (m).

This indicates that the division of the genus *Najas* into two subgenera according to their morphology, also might be supported according to their isozymes. Even the two morphologically most resembling species differ highly in their isozymes. Though precautions must be taken, it can be expected that the other twenty-seven monoecious species of subgenus *Caulinia* would confirm this view because they have even less morphological characters in common with subgenus *Najas*. The latter problem has already been checked in a comparative study on peroxidase isozymes and cytochromes of six species (of which five were monoecious and one was dioecious) from China. Four of the species (*N. gracillima* (Engelm.) Magn., *N. graminea* Del., *N. minor* All. and *N. oguraensis* Miki) could be closely connected, but the relationship of *N. foveolata* Magn. (probably *N. orientalis* Triest & Uotila) and *N. marina* with the above four species was not clear (You et al., 1985). This has also been checked for ADH in seeds and for ME, MDH, GDH, SDH, 6PG, PGI (glucose-P-isomerase), POD and SOD in leaves of *N. gracillima* and *N. minor* from rice fields near Vercelli in Italy. The two species showed entirely different allelic forms when compared to those observed in *N. marina* (Triest, unpublished results).

Phylogenetic relationships are difficult to assess in the genus *Najas*, due to the many convergently vegetative features and extremely reduced flower characteristics, as an adaptation to life and reproduction under water. How related are e.g. *Najas* species which share a number of negative characteristics (spatheless flowers; absence of fibres or septae in leaves)? Hence we think that seed morphology (shape, size and especially the areolation) offers better taxonomic criteria. Our results suggest also that significant differences in isozymes patterns are correlated

with such differences in seed morphology and, consequently, show that isozyme screening might be a very useful taxonomic tool.

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REFERENCES

GOTTLIEB, L. D., 1977. — Electrophoretic evidence and plant systematics. *Ann. Missouri Bot. Gard.* 64 : 161-180.

GOTTLIEB, L. D., 1981. — Electrophoretic evidence and plant populations. *Prog. Phytochem.* 7 : 1-46.

NEI, M., 1978. — Estimation of average heterozygosity and genetic distance from a small number of individuals. *Genetics* 89 : 583-590.

OBERMEYER, A. A., 1966. —*In* CODD, L. E., DE WINTER, B. & RYCROFT, H. B., *Flora of Southern Africa, Najadaceae* 1 : 81-85, fig. 24. Cape and Transvaal Printers.

ROGERS, J. S., 1972. — Measures of genetic similarity and genetic distance. *Studies in genetics, Univ. Texas Publ.* 7213 : 145-153.

SWOFFORD, D. & SELANDER, R. B., 1981. — Biosys-1 : a Fortran program for the comprehensive analysis of electrophoretic data in population genetics and systematics. *J. Hered.* 72 : 281-283.

TRIEST, L., 1987. — A revision of the genus Najas L. (Najadaceae) in Africa and surrounding islands. *Mém. Acad. R. Sci. Outre-Mer*, Cl. Sci. Nat. Méd., Collect. in-8°, Nouv. Sér., 21 (4) : 1-88, pls. I-XVIII.

TRIEST, L., 1988. — A revision of the genus Najas L. (Najadaceae) in the Old World. *Mém. Acad. R. Sci. Outre-Mer*, Cl. Sci. Nat. Méd., Collect. in-8°, Nouv. Sér., 22 (1) : 1-172, pls. I-XXIX.

TRIEST, L., 1989. — Electrophoretic polymorphism and divergence in Najas marina L. (Najadaceae) : molecular markers for individuals, hybrids, cytodemes, lower taxa, ecodemes and conservation of genetic diversity. *Aquat. Bot.* 33 : 301-380.

TRIEST, L. & SYMOENS, J. J., 1985. — Isozyme patterns and taxonomic position of a Central African population of Najas marina L. subsp. armata (Lindb. f.) Horm af Rantzien. *Bull. Jard. Bot. Nat. Belg.* 55 : 261-269.

TRIEST, L., VAN GEYT, J. & RANSON, V., 1986. — Isozyme polymorphism in several populations of Najas marina L. *Aquat. Bot.* 24 : 373-384.

TRIEST, L., VIINIKKA, Y. & AGAMI, M., 1989. — Isozymes as molecular markers for diploid and tetraploid individuals of Najas marina (Najadaceae). *Pl. Syst. Evol.* 166 : 131-139.

VAN GEYT, J., TRIEST, L. & JACOBS, M., 1987. — Characterisation of alcohol dehydrogenase in Najas marina L. *Aquat. Bot.* 28 : 129-141.

YOU Jun, SUN XIANGZHONG & WANG HUIGIN, 1985. — Taxonomy of Najas : a synthetical analysis with evidences on cytology, isozymes and SEM examination. *J. Wuhan Univ.* 4 : 111-132.

Bull. Mus. natn. Hist. nat., Paris, 4e sér., **11**, 1989,
section B, *Adansonia*, nº 4 : 389-390.

Rotala letouzeyana, Lythracée nouvelle du Zaïre

P. Bamps

Résumé : Description d'une nouvelle espèce de *Lythraceae* du Zaïre, *Rotala letouzeyana* Bamps.

Summary : Description of a new species of *Lythraceae* from Zaire, *Rotala letouzeyana* Bamps.

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En examinant les collections indéterminées de ces dernières années, en provenance du Zaïre et déposées dans l'herbier du Jardin botanique national de Belgique à Meise, nous avons pu découvrir une nouvelle espèce de *Rotala* que nous dédions à notre regretté collègue et ami René Letouzey, dont la collaboration avec notre institution fut toujours empreinte de la plus grande cordialité.

La révision monographique du genre par C. D. K. Cook (Boissiera 29 : 1-156, 1979) nous a grandement facilité la mise en évidence de cette nouveauté.

Rotala letouzeyana Bamps, *sp. nov.*

R. myriophylloidi Welw. ex Hiern *affinis sed foliis omnibus oppositis, petalis quadrangularibus, staminorum filamentis longioribus capsulisque duplo longioribus differt.*

Herbe crassulescente, prostrée-ascendante, entièrement glabre ; tige non ramifiée, pouvant atteindre 15 cm de longueur, enracinée aux nœuds inférieurs. Feuilles opposées-décussées, sessiles, les inférieures à limbe étroitement lancéolé et atteignant 5 mm de longueur pour 0,6 mm de largeur, les supérieures ovales-arrondies et plus courtes. Fleurs pourpre violacé, solitaires et axillaires vers le sommet de la tige, hétérostylées ; pédicelles de 0,5 mm de longueur ; bractées adnées à la base des pédicelles et semblables aux feuilles supérieures, largement ovales et arrondies à la base et au sommet, d'environ 3 mm de longueur et de largeur ; bractéoles étroitement triangulaires, de 0,5 mm de longueur ; calice campanulé, à tube d'environ 2,5 mm de longueur et à 4 lobes largement triangulaires et de 1 mm de longueur ; pétales 4, subquadrangulaires, de 1-1,5 mm de longueur et de largeur ; étamines à filet inséré dans le 1/3 inférieur du tube et à anthère elliptique, de 0,7 mm de longueur et 0,4 mm de largeur ; filets des fleurs brévistyles exserts et de 5 mm de longueur, ceux des fleurs longistyles inclus et de 2,5 mm de longueur ; ovaire ovoïde, de 2 mm de hauteur ; style des fleurs brévistyles de 1 mm de longueur, celui des fleurs longistyles de 3 mm de longueur ; stigmate capité. Capsules ellipsoïdales, entourées du calice persistant, de 3 mm de longueur et 2 mm de largeur,

à 2 valves pourvues de stries horizontales très rapprochées et à paroi très mince et très fragile. Graines assez étroitement ovoïdes, plan-convexe, d'environ 1,2 mm de longueur et 0,5 mm de largeur, brun jaunâtre.

TYPE : *Malaisse 13912*, Zaïre, région du Shaba, plateau des Marungu, 5 km ESE de Pepa (29°47′ E-7°44′ S), alt. 1990 m, mare temporaire asséchée depuis quelques jours, 16.6.1986 (holo-, BR ; iso-, K, MO, P, PRE, WAG).

Cette espèce a été récoltée en compagnie de la Labiatée *Limniboza dilungensis* Lisowski & Mielcarek (*Malaisse 14001*), présente également sur les plateaux des Kundelungu et des Kibara, entre 1650 et 1900 m d'altitude.